

## NOTES

DR. WARREN DE LA RUE, F.R.S., has just made a second donation of 100*l.* to the Research Fund of the Chemical Society, stipulating that the whole sum be devoted to a single object.

MR. ROMANES being prevented, by domestic affliction, delivering his lecture at the Royal Institution, on Friday, the 5th inst., as announced, the Hon. Sec., Mr. W. Spottiswoode, Treasurer of the Royal Society, has undertaken to lecture in his stead, on "Quartz; an old Chapter Re-written."

PROF. A. AGASSIZ has returned from his cruise in the Gulf of Mexico, and in spite of bad weather and the grounding of the *Blake*, he has done fully as much as anticipated. As we have already stated, he made use of steel rope for dredging; the rope, however, was only  $1\frac{1}{8}$  inch circumference, not  $1\frac{1}{4}$  inch in diameter as we were led to believe. This steel rope came up fully to his expectations, and he is of opinion that hemp rope is not likely to be again used for deep-sea work by any one who has no time to spare. Prof. Agassiz is preparing a preliminary report to the Superintendent of the Coast Survey of his trip.

THE Iceland mail brings intelligence of a great eruption of Mount Hecla. On February 27, at 5 P.M., several smart shocks of earthquake were felt at Reykjavik, and in the same evening flames were visible behind the mountains, in the direction of Hecla. The Rev. Gudmund Jonsson, who lives close to Mount Hecla, states that at 4.30 P.M. of that day, slight shocks of earthquake began to be felt, these gradually increased till about 5 P.M., when two severe shocks occurred, creating a good deal of alarm, but doing no real damage. At 8 P.M. a tremendous eruption of flames appeared on the northern side of Hecla, the flames gradually increasing in size till they appeared like gigantic columns, double the height of the mountain. When the mail left Iceland on March 22, the eruption still continued, but apparently with diminished violence.

COPIOUS rains have fallen in the eastern districts of Cape Colony, and hopes are now entertained of the speedy termination of the disastrous drought referred to in *NATURE*, vol. xvii. p. 436. The heat in the east of the colony during January last is described as the most intense ever known in even that region of recurring scorching droughts.

THE correspondent of the *Scotsman* at Ottawa describes a curious phenomenon which occurred in the end of February at Niagara Falls. In the vicinity of Table Rock the river-bed was dry for hundreds of yards towards the centre of the Horse-shoe Falls, whilst the river below the falls was about twenty-four feet below high-water mark. For three days the appearance of the river both above and below the falls led to the idea that the falls would entirely cease for a time. This extraordinary circumstance was attributed to incessant high winds from N.E. and an ice-gorge at the rapids above damming the waters of the river till its bed was nearly dry. The icicles which hung from the rocks over which the falls are wont to pour, added to the remarkable character of the scene.

A NOTE sent by the Portuguese Government to the French papers states that a recent law has established in Mozambique and Angola a central council of agriculture, a station for conducting experiments, and a professorship of agriculture. In each capital public lectures will be given by the Government professor on zootechny and scientific agriculture.

THE educational authorities of Berlin possess an enormous garden in one of the suburbs of the city for the purpose of supplying all the schools with fresh botanical specimens. The distribution takes place regularly after April 1, and over 4,000,000 plants are required for botanical instruction during the course of the year.

PROF. OSSIAN-BONNET has been appointed to the Chair of Astronomical Physics in the Paris Faculty of Science and Letters.

A NUMBER of Algerian Arab chieftains have decided to visit the Paris Exhibition, and establish there a complete camp. They will bring with them a variety of Arab coursers.

SOME time since we called attention to the opening of a village museum at Castleton, Derbyshire. The mode of its arrangement has attracted a good deal of attention, and we are glad to hear that it is doing good work in the neighbourhood. A series of scientific lectures in connection with it has been very successful.

THE construction of the Tuileries captive balloon is attracting much attention in Paris. The necessary excavations for the rope-winding roller, the steam-engines, pulley, &c., &c., have modified the appearance of the old Tuileries yard. A large wooden saloon has been erected for the sewing of the canvas, which is quite ready; not less than 100 girls will be required for about a month. The work of making the rope, which is almost finished, has been immense. The weight of the netting will be 3,000 kilograms more than the displacement of the largest balloon in use. Besides the netting, the other ropes connecting the car, &c., will weigh 2,000 kilograms, and the large rope for mooring the balloon to the steam winding apparatus will be 3,000 kilograms. Experiments will be made to show that the rope can bear a traction of 50,000 kilograms, although it is not intended to ascend when the effort to move the balloon will exceed 12,000 kilograms. The real steam power required will be 300 horse-power. The displacement of the balloon will vary according to its station; on the ground it will be 24,430 cubic metres, but, floating at 600 metres in the air, it will be 25,000.

SIR GEORGE AIRY sends to the *Times* of Saturday a paper giving an account of the public standards of length now mounted, by authority of the Corporation of the City of London, in the Guildhall, and of the care that has been taken to insure their accuracy. The standards consist of a line of 100 feet divided into tens of feet, and a line of 66 feet divided into tens of links, with some smaller divisions, on the floor of the Guildhall; and measures of three feet, two feet, and one foot, with subordinate divisions, on the north wall of the Guildhall. The lengths have been verified with the most scrupulous care by the officers of the Standards Department of the Board of Trade, and there is reason to believe that even the longest is not in error to the amount of one-hundredth of an inch. Sir George Airy has inspected these standards, and is satisfied with the general excellence of their construction.

THE meteor which was observed by Mr. Elliot at Hawick (p. 425) on March 25, at 10.20 A.M., was observed in various parts of Scotland, at Dunbar, Dundee, Cupar-Angus, and different parts of Fife. It is described as "apparently" several feet in circumference, cone-shaped, and at Dundee was observed to burst into a thousand fragments when near the earth.

M. KRANTZ, the Director-General of the Paris Exhibition, has been elected the president of a society for scientific excursions and demonstrations at the Champ de Mars. A circular has been issued by this organisation, which contains among its members a large number of influential scientific, industrial, and literary men. It is intended to organise a number of tours in the several sections under the guidance of experienced and competent teachers, the number of auditors admitted to each tour being limited to thirty. The charges will be very low, the society expecting to obtain for its professors and tourists a diminution of the entrance fee. Any communication may be sent to M. La Motte, editor, the secretary of the Association d'Excursions Scientifiques, Quai des Augustins, Paris. This society has been

sanctioned by the Ministry of Public Instruction, and these excursions are quite distinct from the lectures which will be organised on a large scale, as we mentioned a few weeks ago.

THE museum in the Paris Jardin des Plantes has lately been enriched by two very valuable collections. The first includes a vast variety of anthropological and ethnographical objects gathered by M. Pinart during his voyages in Polynesia, among which might be mentioned more especially the ancient stone statues from Easter Island, executed by a race unknown to the present inhabitants. The second consists of over 40,000 specimens in natural history, collected by M. Raffray in New Guinea, chiefly birds and insects.

M. SOLEIL, the well-known optician of Paris, who invented and patented the optical saccharimeter, patronised by Arago, has died at St. Gratian. He was eighty years of age, and had retired for the last twenty years.

ONE of the newly-opened streets in the Luxembourg Gardens, Paris, close to the Observatory, has been called "Rue Herschel," as a compliment to English astronomy.

IN the February session of the Deutsche anthropologische Gesellschaft, Prof. Basian gave an interesting address on the occurrence of similar weapons among widely-separated African tribes, describing more particularly a peculiar kind of javelin, found by Schweinfurth on the eastern coast, by Pogge in the Gaboon region, and by other explorers in the Fan tribe of the interior. On the Gaboon coast it is preserved at present as a fetish, being no longer used. This, as well as other examples, tends to show the common origin of all the African races. The remains of an art closely allied to that of ancient Egypt even, have been discovered on the western coast by Dr. Pogge, who has brought back images, on which the beard and coiffure were the counterparts of those decorating the Egyptian statues 3,000 years ago.

IT has been stated by Mr. Rodwell (NATURE, vol. ix. p. 8), that the ancient Egyptians were acquainted with the principle of the "rider" in the balance. According to M. Wiedemann (*Annalen der Physik*) who has examined over 100 representations of Egyptian balances, this is based on a mistake. The Egyptian balance is a simple equal-armed one; a hook on the upper part of the stand supports a cord with terminal weight, or a plumb-line. In representation (perspective being unknown to the Egyptians), the hook and weight, as seen from the side, were drawn in the plane of the balance, so that the weight, in badly made figures, seems to hang, not from the hook, but from the balance-beam.

WE have received the Report of the Registrar-General of the province of Ontario for 1876. To the usual tables with the Report is added an interesting appendix by Mr. T. H. Monk, on the influence of the weather on the mortality of Toronto. The results show, so far as can be looked for, from one year's mortality numbering only 1,664 deaths, a general correspondence with those obtained by Mr. Buchan and Dr. Arthur Mitchell in their large inquiry into the influence of weather on the mortality of London. We hope Mr. Monk's suggestions will be carried out and that the inquiry will be extended so as to embrace the whole province, the health as well as the mortality of the people, and the registrations of the more prominent, if not of all the diseases, be printed for each week, in order to test more decisively the connection between weather and health and how far changes in the health and mortality of the people and the spread of epidemics may be foretold, as well as changes of weather, now so efficiently carried on in North America.

SINCE Mr. Darwin demonstrated processes similar to digestion in the plant organism, attention has been largely given to the discovery of substances of the nature of ferment in plants. M. van der Harst, of Utrecht, has lately examined the seeds of

the garden bean (*Phaseolus vulgaris*) in this respect. He finds in these; when in germination, a ferment which can be extracted by means of glycerine. It has the power of transforming albuminous matter into peptones, and starch meal into glucose. It occurs exclusively in the seed lobes.

A CORRESPONDENT sends us the following extract from a letter of one of the officers of the ship *Newcastle*, of London. It is dated Brisbane, Sunday, 30th December, 1877. "Last Friday (28th) in the afternoon, it came over very black, so we expected a thunderstorm. Well, it came on to blow from the south, and then to hail. At first the hailstones were about the size of a marble, but they continued to increase, until they became as large and exactly the shape of a tomato. The captain weighed three and found that the three together weighed one pound. I was on the poop, under the awning, but the awning was blown adrift, which compelled me to beat a hasty retreat. Nearly all the glass in our large saloon ports on the starboard side is broken. To-day, when I was on shore, the houses in Queen's Street, facing the south, looked as though there had been a great fire, not a pane of glass left, and in many cases the frames gone altogether. Of course, the backs of the houses on the other side of the street must have suffered to the same extent. During the squall, which lasted about three-quarters of an hour, the river was one mass of foam, caused by the hailstones raining upon its surface in such numbers."

AN interesting archæological discovery has been made at Cancelli in the neighbourhood of Naples, by the uncovering of the cemetery of the ancient city of Lucullula. The excavations made thus far have brought to light an immense number of interesting objects of ancient Greek civilisation. At Clermont-Ferrand, also, in Southern France, an old Roman villa has been laid bare and found to possess a rich treasure in the way of ornaments, &c.

AN interesting geological discovery has recently been made at Donaueschingen (Baden). A complete and very well-preserved skeleton of the prehistoric musk-deer (*Cervus elaphus muscosus*) has been found in the neighbourhood of this little town. The horns are of gigantic size and show over forty ends; it is asserted that this skeleton is the first complete one known.

M. LUIGI PONCI describes, in *L'Elettrocista*, a new electric battery of great simplicity. It consists of the usual glass jar and porous cylinder; the latter, however, is filled with a solution of ferrous chloride (35° Beaumé), and has for a pole an iron plate, while the external solution is of ferric chloride (also 35° B.), and contains a carbon pole. The electro-motive power is 0.9 of that of a Daniel cell.

A ST. PETERSBURG correspondent, "C. S.," desiring to purchase a dictionary of chemistry, writes that he would gladly avail himself of a critical comparison of existing works of the kind. He suggests that a comparative estimate might be given through the pages of this journal. At the same time one of our Paris correspondents writes us on the appearance in Paris of the 25th number of the French "Dictionnaire de Chimie pure et appliquée," edited by Prof. Würtz; closing with the article on Vanadium. This important work was commenced by Prof. Würtz in 1869, assisted by a corps of twenty-five leading French chemists, and although delayed materially by the war and its results, has been pushed forward vigorously, until it is now on the eve of completion. It will form altogether five volumes, numbering nearly 5,000 pages, and will be the first record of chemistry approaching completeness in the French language. The chemist is still dependent in a great measure on the English language, for the seven bulky volumes of Watts's "Dictionary," including its two supplements, form the most extensive as well as most recent



compendium of chemical knowledge. Although Germany takes the lead in regard to chemical discovery, she is far behindhand in this respect. The new edition of the "Handwörterbuch," based on the well-known work of Liebig, Wöhler, and Kolber, now edited by Prof. Fehling, was commenced in 1871, but has progressed at a snail's pace, being only half way through the letter E, and the second of the six volumes which it will compose, not being yet completed. The Italian chemists have recently issued a dictionary of chemistry on a somewhat smaller scale than those alluded to above, but well edited and written.

THE additions to the Zoological Society's Gardens during the past week include two Pudua Deer (*Cervus humilis*) from Chili, a Black-faced Spider-Monkey (*Ateles ater*) from East Peru, deposited; an Arabian Gazelle (*Gazella arabica*) from Arabia, presented by Mr. W. W. Webb.

### FOG SIGNALS<sup>1</sup>

DURING the long, laborious, and, I venture to think, memorable series of observations conducted under the auspices of the Elder Brethren of the Trinity House at the South Foreland in 1872 and 1873, it was proved that a short 5½ inch howitzer, firing 3 lbs. of powder, yielded a louder report than a long 18-pounder firing the same charge. Here was a hint to be acted on by the Elder Brethren. The effectiveness of the sound depended on the shape of the gun, and as it could not be assumed that in the howitzer we had hit accidentally upon the best possible shape, arrangements were made with the War Office for the construction of a gun specially calculated to produce the loudest sound attainable from the combustion of 3 lbs. of powder. To prevent the unnecessary landward waste of the sound, the gun was furnished with a parabolic muzzle, intended to project the sound over the sea, where it was most needed. The construction of this gun was based on a searching series of experiments executed at Woolwich with small models, provided with muzzles of various kinds. The gun was constructed on the principle of the revolver, its various chambers being loaded and brought in rapid succession into the firing position. The performance of the gun proved the correctness of the principles on which its construction was based.

Coincident with these trials of guns at Woolwich gun-cotton was thought of as a possibly effective sound-producer. From the first, indeed, theoretic considerations caused me to fix my attention persistently on this substance; for the remarkable experiments of Mr. Abel, whereby its rapidity of combustion and violently explosive energy are demonstrated, seemed to single it out as a substance eminently calculated to fulfil the conditions necessary to the production of an intense wave of sound. What those conditions are we shall now more particularly inquire, calling to our aid a brief but very remarkable paper, published by Prof. Stokes in the *Philosophical Magazine* for 1868.

A sound wave consists essentially of two parts—a condensation and a rarefaction. Now air is a very mobile fluid, and if the shock imparted to it lack due promptness, the wave is not produced. Consider the case of a common clock pendulum, which oscillates to and fro, and which therefore might be expected to generate corresponding pulses in the air. When, for example, the bob moves to the right, the air to the right of it might be supposed to be condensed, while a partial vacuum might be supposed to follow the bob. As a matter of fact, we have nothing of this kind. The air particles in front of the bob retreat so rapidly, and those behind it close so rapidly in, that no sound-pulse is formed.

The more rapid the shock imparted to the air, the greater is the fractional part of the energy of the shock converted into wave motion. And as different kinds of gunpowder vary considerably in their rapidity of combustion, it may be expected that they will also vary as producers of sound. This theoretic inference is completely verified by experiment. In a series of preliminary trials conducted at Woolwich on the 4th of June, 1875, the sound-producing powers of four different kinds of powder were determined. In the order of their sizes they bear the names respectively of Fine-grain (F.G.), Large-grain (L.G.),

Rifle Large-grain (R.L.G.), and Pebble-powder (P.). The charge in each case amounted to 4½ lbs., four 24-pound howitzers being employed to fire the respective charges. There were eleven observers, all of whom, without a single dissentient, pronounced the sound of the fine-grain powder loudest of all. In the opinion of seven of the eleven the large-grain powder came next; seven also of the eleven placed the rifle large-grain third on the list; while they were again unanimous in pronouncing the pebble-powder the worst sound-producer. These differences are entirely due to differences in the rapidity of combustion.

These are some of the physical reasons why gun-cotton might be regarded as a promising fog-signal. Firing it as we have been taught to do by Mr. Abel, its explosion is more rapid than that of gunpowder. In its case the air-particles, alert as they are, will not, it may be presumed, be able to slip from places of condensation to places of rarefaction with a rapidity sufficient to forestall the formation of the wave.

As regards explosive material, and zealous and accomplished help in the use of it, the resources of Woolwich Arsenal have been freely placed at the disposal of the Elder Brethren. Gen. Campbell, Gen. Younghusband, Col. Fraser, Col. Maitland, and other officers, have taken an active personal part in the investigation, and in most cases have incurred the labour of reducing and reporting on the observations. Guns of various forms and sizes have been invoked for gunpowder, while gun-cotton has been fired in free air, and in the foci of parabolic reflectors.

On February 22, 1875, a number of small guns, cast specially for the purpose—some with plain, some with conical, and some with parabolic muzzles, firing 4 oz. of fine-grain powder, were pitted against 4 oz. of gun-cotton, detonated both in the open and in the focus of a parabolic reflector. The sound produced by the gun-cotton, reinforced by the reflector, was unanimously pronounced loudest of all. With equal unanimity, the gun-cotton detonated in free air was placed second in intensity. Though the same charge was used throughout, the guns differed considerably among themselves, but none of them came up to the gun-cotton either with or without the reflector. A second series, observed from a different distance on the same day, confirmed to the letter the foregoing result.

Meanwhile, the parabolic muzzle-gun, expressly intended for fog-signalling, was pushed rapidly forward, and on March 22 and 23, 1876, its power was tested at Shoeburyness. Pitted against it were a 16-pounder, a 5½-inch howitzer, 1½ lb. of gun-cotton detonated in the focus of a reflector, and 1½ lb. of gun-cotton detonated in free air. On this occasion, nineteen different series of experiments were made, when the new experimental gun, firing a 3-lb. charge, demonstrated its superiority over all guns previously employed to fire the same charge. As regards the comparative merits of the gun-cotton fired in the open, and the gunpowder fired from the best constructed gun, the mean values of their sounds were found to be the same. Fired in the focus of the reflector, the gun-cotton clearly dominated over all the other sound-producers.<sup>1</sup>

The whole of the observations here referred to were embraced by an angle of about 70°, of which 50° lay on the one side and 20° on the other side of the line of fire. The shots were heard by eleven observers on board the *Galatea*, which took up positions varying from 2 miles to 13½ miles from the firing-point. In all these observations, the reinforcing power of the reflector, and of the parabolic muzzle of the gun, came into play. But the reinforcement of the sound in one direction implies its withdrawal from some other direction, and accordingly we find that at a distance of 5½ miles from the firing-point, and on a line, including nearly an angle of 90°, with the line of fire, the gun-cotton in the open beat the new gun; while behind the station, at distances of 8½ miles and 13½ miles respectively, the gun-cotton in the open beat both the gun and the gun-cotton in the reflector. This result is rendered more important by the fact that the sound reached the Mucking Light, a distance of 13½ miles, against a light wind which was blowing at the time.

Theoretic considerations render it probable that the shape of the exploding mass would affect the constitution of the wave of sound. I did not think large rectangular slabs the most favourable shape, and accordingly proposed cutting a large slab into fragments of different sizes, and pitting them against each other. The differences between the sounds were by no means so great as the differences in the quantities of explosive material might lead one to expect. The mean values of eighteen series of

<sup>1</sup> "Recent Experiments on Fog Signals." Abstract of paper read at the Royal Society, March 21. By Dr. Tyndall, F.R.S., Professor of Natural Philosophy in the Royal Institution.

<sup>2</sup> In this case the reflector was fractured by the explosion.